

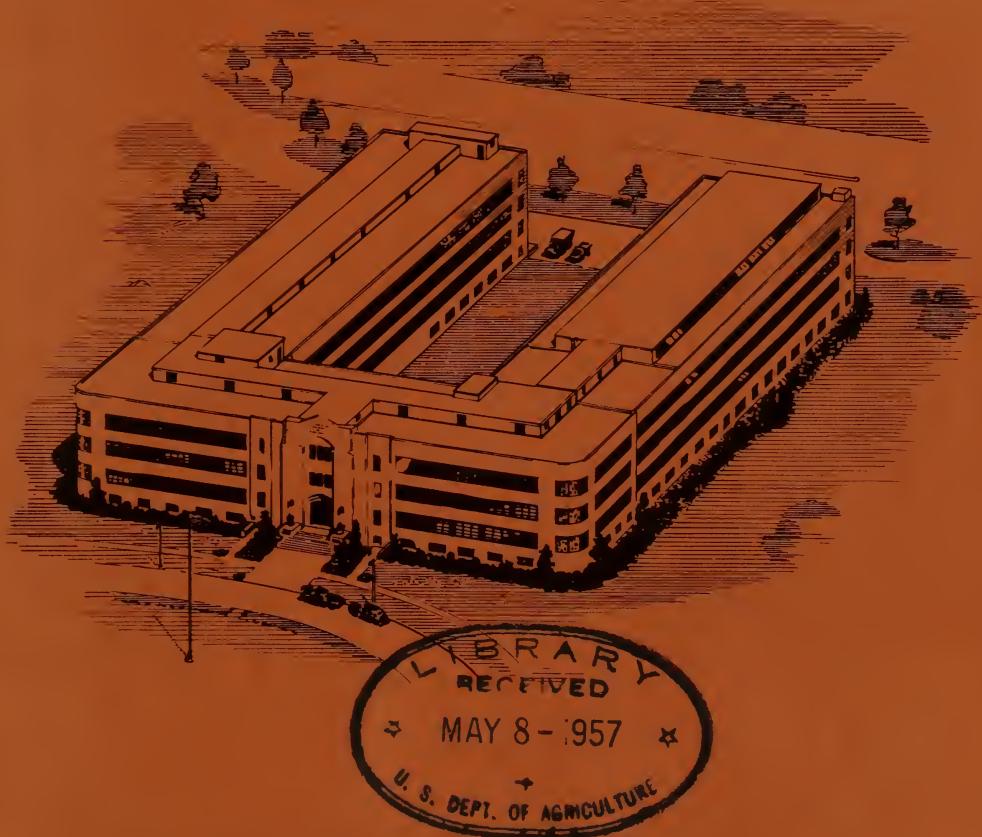
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# EASTERN UTILIZATION RESEARCH AND DEVELOPMENT DIVISION



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## UNITED STATES DEPARTMENT OF AGRICULTURE

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Deputy Administrator

Utilization Research and Development

2a

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Eastern Regional Research Laboratory  
Wyndmoor, Pa.

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W. C. AULT

Animal Fats

T. L. McMEEKIN

Animal Proteins

J. J. WILLAMAN

Biochemical

C. F. KREWSON

Biologically Active Chemical Compounds

R. K. ESKEW

Engineering &amp; Development

C. F. WOODWARD

Fruit &amp; Vegetable

J. NAGHSKI

Hides, Tanning Materials, &amp; Leather

## Washington and Beltsville Sections

H. STEVENS

Allergens (Washington, D. C.)

W. I. PATTERSON, Acting

Dairy Products (Washington, D. C.)

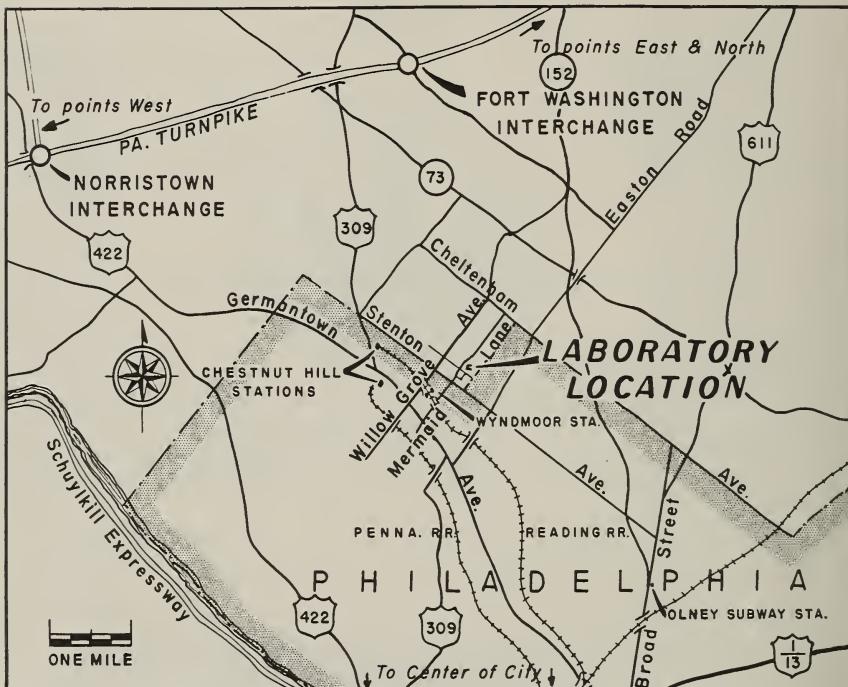
W. L. SULZBACHER

Meat (Beltsville, Md.)

March 1957

# VISITORS WELCOME

Visitors are always welcome. Conferences may be arranged with staff members to discuss phases of the research program in fields of particular interest. Groups will be given conducted tours of the laboratories. Arrangements for visits should be made with either the Director, Section Heads, or other administrative personnel listed on page 1.



## EASTERN UTILIZATION RESEARCH AND DEVELOPMENT DIVISION

Eastern Regional Research Laboratory  
600 E. Mermaid Lane  
Wyndmoor, Pa.

Open Monday through Friday  
8:30 a.m. to 5 p.m.

Telephone  
CHEstnut Hill 7-5800

## TRANSPORTATION INSTRUCTIONS

By car: From the north via U.S. 309, or from Fort Washington Interchange of Pennsylvania Turnpike, follow U.S. 309 south to Stenton Avenue, turn left on Stenton and drive to Mermaid Lane, turn left, two blocks to Laboratory. From central Philadelphia, go north on Broad Street to Stenton Avenue (6200 north), turn left, drive on Stenton to Mermaid Lane, turn right, two blocks to Laboratory.

By Pennsylvania Railroad: Take Chestnut Hill train at Suburban Station, 17th and Arch Streets, Philadelphia; at 30th Street Station; or at North Philadelphia Station to Chestnut Hill Station (end of line). Laboratory is  $1\frac{1}{2}$  miles from this Station. Take taxi to Laboratory or take south-bound "L" bus marked "Broad-Olney Subway" to Mermaid Lane and walk east two blocks to Laboratory.

By Reading Railroad: Take Chestnut Hill train at Reading Terminal, 12th and Market Streets, Philadelphia; or at Wayne Junction (connection with B&O Railroad) to Wyndmoor Station. Laboratory is five blocks east of this Station on Mermaid Lane.

By Philadelphia local transportation: Take Broad Street subway northbound to Olney Avenue. Ask for bus exchange when paying fare. Transfer to "L" bus marked "Erdenheim" at northwest corner of Broad Street and Olney Avenue. Get off bus at Stenton Avenue and Mermaid Lane, walk east two blocks to Laboratory.

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Washington, D. C., sections (hours: 9 a.m. to 5:30 p.m., Monday through Friday) are located at South Building, U. S. Department of Agriculture, 14th Street and Independence Avenue, SW., Washington, D. C.

Beltsville, Md., section (hours: 8 a.m. to 4:30 p.m., Monday through Friday) is located at the Agricultural Research Center, Beltsville, Md., on U.S. 1, 15 miles northeast of Washington. Greyhound and National Trailways buses, which stop on U.S. 1 at Beltsville, start from the terminal at 12th Street and New York Avenue, NW. Regular bus stop is 2 miles from office of Superintendent of the Center. Two special Greyhound buses, which go directly to the office of the Superintendent of the Center, leave the terminal in Washington at 6:55 a.m., and 7:10 a.m., Monday through Friday.

## ORIGIN

Utilization research, as such, became a recognized part of the program of the U. S. Department of Agriculture in 1938, when Congress provided for the construction of four new laboratories, one in each major farm-producing area. The work of these laboratories was to find new and wider outlets and markets for farm commodities, especially those in surplus. Underlying this new research venture was the concept that a consistent, coordinated research program, such as that carried out by large industrial firms to further the utilization of their products, could be applied to the problems of American agriculture.

Subsequently, by the "Research and Marketing Act of 1946," Congress authorized additional research, and for the first time permitted research to be carried out by contract with outside organizations when the work could be conducted more efficiently by this means. This act also set up advisory committees from producers, industry, government, and science, to give guidance and direction to the overall research program of the Department.

## ADMINISTRATION

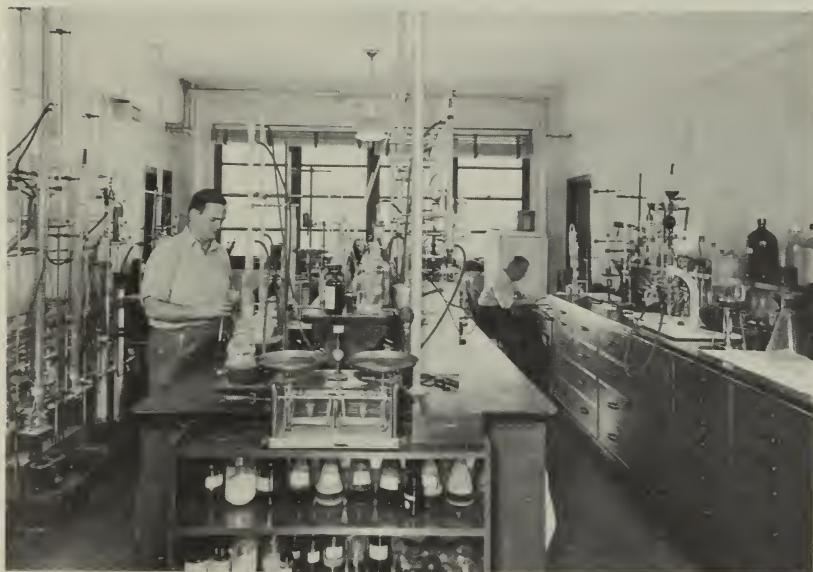
Most of the research in the U. S. Department of Agriculture is administered by the Agricultural Research Service (ARS), which is one of the agencies comprising the functional group known as Federal-States Relations.

ARS consists of two research groups, one of which is utilization research. Utilization research, in turn, is carried on in four utilization research and development divisions, as follows: The Eastern Division in Wyndmoor, Pa.; the Northern Division in Peoria, Ill.; the Southern Division in New

Orleans, La.; and the Western Division in Albany, Calif. General information about the Utilization Research and Development Divisions is given on the last page.

## PHYSICAL FACILITIES

The main laboratory of the Eastern Utilization Research and Development Division is situated on a 31-acre tract of land in a suburb of Philadelphia called Wyndmoor. It is a "U"-shaped building of three stories and a basement. Offices, library, conference room, and other general services are in the front of the building, which is the 211-foot base of the "U". Most of the 72 separate laboratories and other special research rooms are located in the north wing; a pilot plant that extends the full height of the building occupies the south wing. Both the offices and the laboratories are air-conditioned.

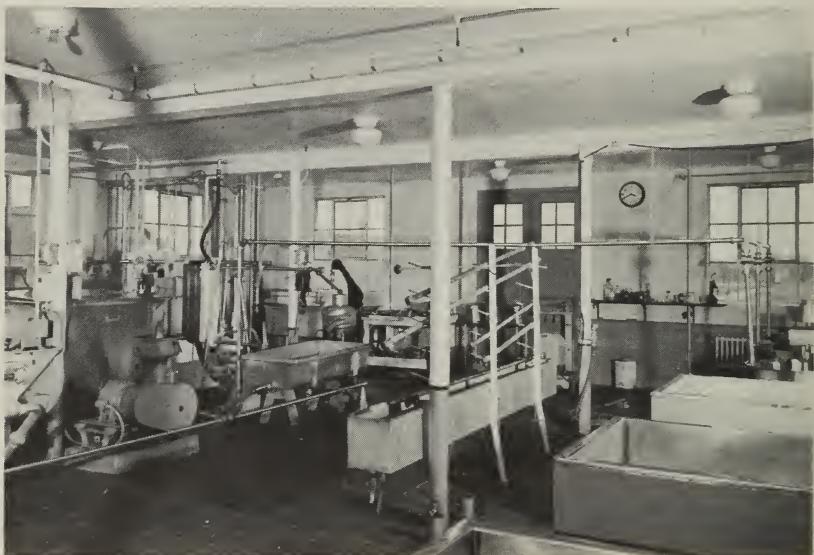


Typical laboratory room in the Eastern Regional Research Laboratory. A small office adjoins each laboratory room.

Somewhat removed from the main "U"-shaped laboratory, three large laboratory rooms are housed in a separate building. These are especially designed for large-scale sol-



Pilot plant of the Eastern Regional Research Laboratory.



Cheese laboratory of the Eastern Utilization Research and Development Division,  
Beltsville, Md.

vent extractions and high-pressure experiments. Other structures on the laboratory grounds include one in which large-scale pilot-plant drying operations are performed, a power plant, and a garage. Some buildings that were standing before the main laboratory was built are now used for storage.

In the Allergens Section of the Eastern Utilization Research and Development Division, in Washington, D. C., facilities are provided for working with experimental animals. The Dairy Products Section includes a dairy processing plant in Washington, D. C., and cheese-manufacturing equipment in Beltsville, Md. Research scientists of the Meat Section in Beltsville have access to complete facilities for the slaughtering of livestock and the processing, analysis, and taste-testing of meat.

## RESEARCH PROGRAM

The numerous and complex problems of agriculture are of national concern because the state of agriculture vitally affects all segments of the economy. As one means of maintaining agriculture in a healthy condition, the Utilization Research and Development Divisions of ARS seek new and better ways to utilize farm products. The ultimate objective of their research is to provide more income for the farmer from the crops he grows. Industry also is benefited as new, or improved, or more stable products are developed that can be made from agricultural raw materials, and the consumer is benefited as these products are made available at reasonable costs.

In their search for new uses, the Divisions and the Department seek advice and suggestions from many sources. Among these are the permanent Research and Marketing Advisory Committees, which consist of from 9 to 15 members each. They review and make recommendations concerning the Department's research program. At present there are 26 of these committees, most of which review utilization research. There is also the 11-member overall Agricultural Research Policy Committee, as well as 4 other committees that coordinate the research programs between the States and the Department. Temporary committees may be established from time to time to deal with special problems as they arise.

Each Division engages in research on assigned commodities. Because of their widespread economic importance,

research on some commodities may be conducted by more than one Division, especially if they present problems peculiar to different geographical areas.

Our Eastern Division conducts research on:

EASTERN DECIDUOUS FRUITS  
EASTERN VEGETABLES  
MEAT  
DAIRY PRODUCTS  
ANIMAL FATS  
HIDES, TANNING MATERIALS, AND LEATHER  
HONEY  
MAPLE PRODUCTS  
TOBACCO  
WOOL BYPRODUCTS  
PLANT PRECURSORS OF CORTISONE  
BIOLOGICALLY ACTIVE PLANT COMPOUNDS  
ALLERGENS OF AGRICULTURAL PRODUCTS

The 14-state region served by the Eastern Division comprises:

CONNECTICUT	NEW JERSEY
DELAWARE	NEW YORK
KENTUCKY	PENNSYLVANIA
MAINE	RHODE ISLAND
MARYLAND	VERMONT
MASSACHUSETTS	VIRGINIA
NEW HAMPSHIRE	WEST VIRGINIA

The research program is divided among 11 sections, each of which consists of atleast three subject-matter units. Eight of the sections are located in the Eastern Regional Research Laboratory, Wyndmoor, Pa.; two (dairy products and allergens) in the Department of Agriculture, Washington, D. C., and one (meat) in the Agricultural Research Center, Beltsville, Md.

A brief description of the principal fields of work and the objectives of the 11 research sections follows.

## Analytical, Physical-Chemical, and Physics Section

The chemical and technological program of the Division requires the application of specialized physical and analytical techniques--infrared and ultraviolet spectrophotometry, colorimetry, x-ray diffraction, chromatography, radioactive-tracer techniques, polarography, and electron microscopy. Such specialized work is performed in this section, where new and improved analytical and micro-analytical methods are developed, and analyses are performed as a service to other sections of the Division. Among the studies to which these techniques are making an important contribution are: Evaluation of the fundamental physical properties of leather and also of plastics derived from



The recording x-ray diffraction unit, used at the Eastern Laboratory for identification and characterization of crystalline materials and for investigations on the structure of plastics, fibers, and hides.

animal fats; investigation of the fundamental physical-chemical properties of proteins and other high-molecular-weight compounds; and analysis of the basic factors influencing the texture and quality of processed fruits and vegetables.

## Animal Fats Section

Inedible animal fats are studied in this section as potential raw materials for the chemical industry. Their conversion to new chemical intermediates and end products, such as lubricants and lubricant additives, water repellents, plasticizers, waxes, and detergents, is investigated. Work is done on the synthesis of new monomers for conversion to plastics having special properties. A significant part of the work of the section is the development of new methods for studying the composition of fats, including wool grease. These methods are finding application in determining the role of fats in metabolism. Research is also done on lard and other edible animal fats with a view to improving their physical characteristics.

## Animal Proteins Section

Research is being directed in this section to the improvement of milk products by studies on the composition, structure, and properties of milk proteins. Methods are being developed for the isolation and characterizations of the pure proteins. Factors affecting the stability of milk proteins during processing, such as temperature, acidity, and protein concentration, are being investigated. Studies are also being made on the biological oxidation of dairy wastes in order to develop methods for preventing stream pollution.

## Biochemical Section

Studies on uncultivated plants, honey, and maple products, are conducted in this section. Uncultivated plants are collected and analyzed for substances that can be used to synthesize the drug cortisone and similar medicinals. The composition of honeys of various floral sources is determined. A broad and continuing program on the improvement of maple products is maintained, from the collection of maple sap to the preparation of maple confections. New and extended uses and improved processing methods are sought for both honey and maple products.

## Biologically Active Chemical Compounds Section

Various plant-growth regulators (including "weed-killers") are synthesized in this section from agricultural

raw materials, with the object of finding new compounds and formulations that will improve agricultural productivity. Through the synthesis of experimental compounds, nematicides are sought which plants will translocate to their roots where control of parasite infestation is required. Biochemical factors determining the resistance of plants to disease are investigated.

### **Engineering and Development Section**

Through engineering research on a pilot-plant scale and by means of cost analyses, this section develops and evaluates processes for agricultural products and provides basic engineering data for their projection to commercial use. Studies are made of the probable type of equipment required for large-scale operation, the materials of construction, the behavior of reactants in large bulk, and other factors pertinent to operating the processes on a large scale. This section also designs specialized equipment where standard apparatus is not applicable, provides engineering consulting services to other sections of the Division, and prepares samples of products developed by the Division for commercial evaluation.

### **Fruit and Vegetable Section**

Fundamental and applied research being carried out in this section is designed to enlarge the markets and increase the usefulness of Eastern-grown fruits and vegetables. Their characteristics when raw, and also when preserved by freezing, canning, or drying, are investigated. A better understanding of the qualities of both fresh and processed fruits and vegetables is sought through a fundamental study of their composition. Specifically under consideration are the effect of harvesting practices on the quality of processed red sour cherries; improvement of processed apple, tomato, and peach products; and the development of new and better processed products from potatoes and other vegetables.

### **Hides, Tanning Materials, and Leather Section**

The research program being carried out in this section is aimed at increasing the utilization of hides, skins, and leather. Fundamental work is being done on the hide proteins, especially collagen, so that the interaction between these proteins and the tannin can be better understood and used more effectively. Improved methods of unhairing hides



Evaluation of leather samples.

and quicker and more economical tanning processes are being sought. The potentialities of chemically modifying the hides to produce new leathers with more desirable properties are also being investigated.

### Allergens Section

In this section fundamental chemical and immunological investigations are conducted on the allergens of agricultural products. Utilization of such products is often restricted by natural and ordinarily harmless components, called allergens, which induce allergic sensitivity or cause allergic diseases. The purpose of this work is to isolate and identify these allergens and then to correlate their chemical constitution with their specific physiological capacity to produce or react with antibodies in experimental animals, and in humans. Allergic reactions are employed also to identify chemically similar proteins, such as those from blood serum and milk serum. They have also been used to demon-



Detecting and distinguishing allergens of agricultural products by means of the kymograph, a part of the Schultz-Dale apparatus. The reaction of sensitized animal muscle tissue to an allergen is recorded on the smoked screen of the kymograph.

strate the effectiveness of vegetable oil refining for excluding cottonseed allergen from edible cottonseed oil.

### Dairy Products Section

This section studies the utilization of milk and milk products, including concentrated and dried milk, cheese, butter, and other manufactured milk products. Basic investigations of the physical and chemical properties of milk are conducted to develop information that might aid in the solution of problems encountered in the handling, preservation, and processing of milk. Improved processes are sought for manufacturing cheese and for preserving milk by freezing, concentration, and drying. Studies are also carried out aimed at improving the keeping quality of butter and butter oil, and in extending the use of nonfat dry milk solids in baking.

## Meat Section

Physical, biological, and technological investigations are being conducted in this section on fresh and processed meat and meat products. From this research are developed improved methods of handling, preserving, and processing meats. Bacteriological and chemical studies yield fundamental information on the preservation of quality in cured and freezer-stored meats, and form the basis for the improvement of processing methods. Specific studies include work on the improved use of raw materials in sausage, methods of aging to obtain more tender beef, the oxidation of the fatty tissues of meat, and the role of microorganisms in meat curing.

## SOME PAST AND PRESENT ACTIVITIES OF THE EASTERN DIVISION

### Animal Products

The animal products under investigation by the Eastern Utilization Research and Development Division--milk, meat, fats, and hides--are among agriculture's most important commodities, and a large part of the research program of the Division is concerned with them.

Research on milk and milk products is conducted largely on milk, cheese, and butter. One of the important aims of the milk program is the development of a whole milk powder that will reconstitute readily to make a drink of fresh-milk quality, even after storage. Such a product would expand the market for milk and alleviate the surplus problem. Important to such a practical development, however, is a good background of fundamental knowledge. The structure and behavior of milk proteins have been under study at the Division for a number of years, yielding information of great value in understanding milk-processing problems. Basic studies using the ultracentrifuge have revealed much of the physical structure of the colloidal particles of fat-free milk, and have clarified the changes that take place during the manufacture of evaporated milk.

The cheese work has produced a quicker and easier way of making Cheddar cheese with conventional equipment, and manufacturing methods for other cheeses, such as cottage and Swiss, are now under study. Flavor studies are being made on Cheddar, Romano, and Provolone cheese.

Research on butter includes study of its minor components as a clue to its stability and consistency.

On meat and meat products, chemical, physical, and biological research is providing much-needed fundamental knowledge of meat structure and composition, the reaction of meat to aging and processing, and methods of meat preservation. The research of the section contributes materially to an understanding of the microbiology of meat and meat products. Chemists are investigating the cause and prevention of rancidity in the fatty tissues of frozen and cured meats. The work of the Meat Section has established the technological basis for successful meat dehydration. A means of tenderizing tough beef is now being sought.

Animal fats are the meat industry's most valuable by-product. In recent years, however, the market price for animal fats has dropped drastically as vegetable-oil shortenings with their better keeping qualities have been displacing lard, and synthetic detergents have been supplanting



Some plastic articles containing plasticizers developed by the Eastern Division from fats.

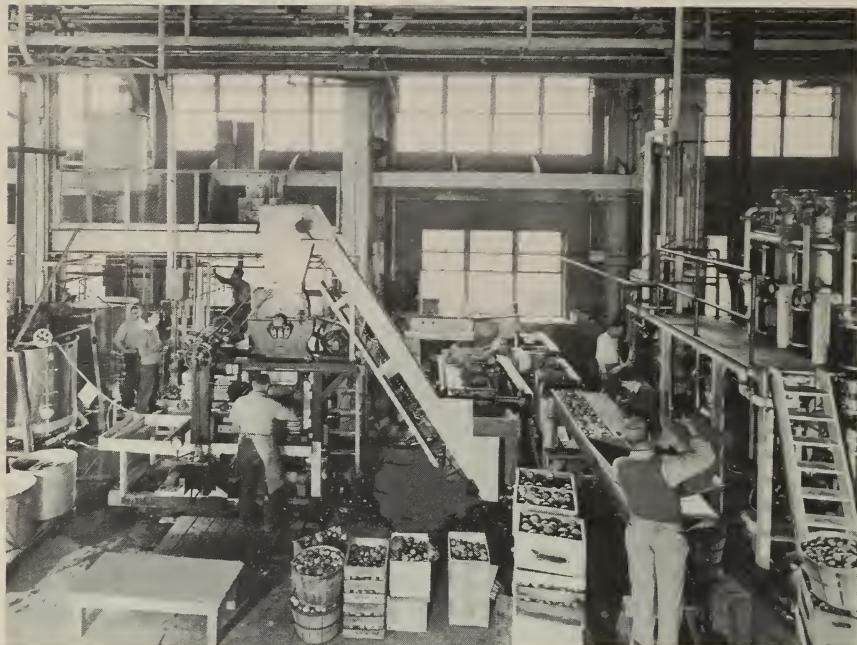
soap made from tallow. As for the edible fats, research in which the Eastern Division played a role has improved the keeping quality of lard by the development of improved antioxidants. For the inedibles, a variety of new industrial uses have been found which have helped stabilize the market and have substantially increased the livestock industry's return from these byproducts. A wide use for inedible

animal fats has been found in feeds. The market for tallow soaps in the manufacture of synthetic rubber has been retained. Synthetic detergents and other surface-active agents are being made from animal fats. New stabilizing plasticizers have been developed from these fats. They have been used to make an improved oleic acid. Present research is aimed largely at developing new products from inedible animal fats for use in the chemical industry.

Hides and skins are another important byproduct of the meat processor. Like the animal fats, these no longer bring the prices they once did, largely because the demand for leather has not kept pace with hide supplies. Synthetics are replacing leather for many applications, forcing cattle raisers to export many of their hides at lower prices. To place leather in a better competitive position, improvements in its quality and in the processes used for its manufacture are being sought at the Eastern Division. At the same time, new uses for hides other than in the making of leather are being studied in an effort to free the hide market from dependence on the leather industry. Research at the Division has resulted in a method for the alum retannage of leather that appreciably improves its qualities for shoe insoles.

#### Fruit Flavors: Fruit Juice Concentrates and Powders

Research at the Eastern Division is making a significant contribution to the present trend toward the marketing of fruits in the form of liquid concentrates, powders, and other processed products. A milestone in this field was reached when engineers of the Division found a way to recover and concentrate the unaltered volatile flavors, or "essence," of various fruit juices. By this essence-recovery method, full flavored concentrates of apple, grape, and cherry juice have been prepared. More recently, work has been done on true-fruit-flavored juice powders. The process has been applied to recovering the flavor from apple skins and cores, byproducts in the making of applesauce. Even the aroma given off in the manufacture of jams, jellies, and preserves, can be captured by this process and used for flavoring. The fruit-research program concerns principally the Eastern deciduous fruits, such as apples, grapes, cherries, peaches, and berries.



Making apple-juice concentrate with essence restored in the pilot plant of the Eastern Regional Research Laboratory.

### Vegetable Utilization

Present emphasis in the Division's vegetable research is on the composition of vegetables and the effect of their components on quality, both when fresh and when processed. Newer methods of analysis, particularly those based on chromatographic techniques, are being used to separate and identify the minor vegetable constituents, particularly the nitrogen compounds. Although present in minute amounts, these minor compounds may play an important role in the processing behavior of certain vegetables. Examples of the studies being carried out in this field are the relation of potato composition to chip quality and the development of improved processed tomato products.

Some completely new vegetable products have come out of this research program. One of these is "potato flakes," a dehydrated mashed-potato product. This development promises to provide a new large-scale outlet for potatoes, especially since some varieties of potatoes can be made into flakes that are not satisfactory for other dehydrated mashed-potato products. Other dehydrated products are

deep-fat-fried vegetables which can be consumed as snacks like potato chips or used in dry soup mixes. In Argentina, tomato leaves are used as the source of an interesting substance called tomatine, which was discovered by Eastern Division scientists, and which not only appears to increase the plant's resistance to disease, but may also find use as a drug.

### Special Crops

Aside from fruits and vegetables, there are some special crops and plants on which research is being done at the Eastern Division, including tobacco, maple, honey, and plants that yield materials of importance in medicine and industry, such as cortisone precursors and vegetable tannins.

Tobacco has been studied at the Eastern Division for a number of years. Past work has pointed to the utilization of tobacco byproducts such as nicotine, which is an effective insecticide. Presently, investigations are being made on the composition of cigar smoke, and on the nature of the alkaloids and resins of tobacco. One of the outstanding achievements of the tobacco program was the discovery that rutin, a constituent of tobacco, buckwheat, and other plants, can be used in the treatment of patients with fragility (weakness) of the capillary blood vessels. Rutin and a derivative, quercetin, are now in widespread use.

Maple products and honey are agricultural commodities for which extended markets are needed. Maple research at the Eastern Division is responsible for new processes and products that are making maple trees a greater source of profit for the farmer. A process for producing a high-flavored maple syrup resulting from this work has been applied commercially in the development of a number of new maple products that are now on the market. Honey is important to agriculture because of the pollination of crops by bees. Research on new uses for honey is seeking to expand this small but vital industry and make it independent of government subsidy.

When the effectiveness of cortisone was discovered for the treatment of arthritis and related conditions, the Eastern Division, in cooperation with other Government agencies, undertook a survey of uncultivated plants to find



Drying plant parts preparatory to analysis for cortisone precursors.

new substances that could be used to synthesize this important drug. Of the thousands of species shipped to the Laboratory from many parts of the world, a number of promising cortisone precursors have been found, and certain of these plants are being field-tested to determine if they can be cultivated domestically to provide an economical source of raw material for cortisone synthesis. Aside from the primary purpose of this survey, a vast amount of basic information on the composition of uncultivated plants is being accumulated that should be of considerable value in the future development of new field crops.

In their search for new domestic tannin sources, scientists of the Eastern Division analyzed some years ago the roots of a plant that grows wild in the Southwest, called canaigre. They found them to be rich in a material suitable for tanning heavy leather. About 10 tons of canaigre tannin were extracted in the Laboratory's pilot plant for a commercial-scale test by a tannery. The sole leather thus tanned is to be used in the manufacture of shoes for a large wear test to be conducted by the Army Quartermaster Corps. While this test is in progress, plant scientists of the De-

partment are field-testing canaigre to determine its suitability as a field crop.

In a field of work not related to any specific crop, materials of agricultural origin are being synthesized into plant-growth regulators, primarily for use as weed-control agents. Some of the compounds synthesized in this program have been found to possess highly selective ability to control the growth of weeds without significantly affecting the crop. Besides the immediate practical value of such research to the weed-control problem, the findings should lead to a better understanding of the fundamental mechanisms of plant growth with resulting long-term benefits to agriculture.

### Agricultural Wastes

The utilization and disposal of wastes is an important problem in agriculture. Such wastes occasionally can be converted into a useful product that the farmer can sell at a profit, thus obtaining higher returns for his crops. Even if the selling price of the product is not sufficient to cover the cost of processing, such a utilization of waste at least helps to bear the cost of its disposal. The Eastern Division has made an extensive study of the composition of vegetable field wastes to determine their potential value for byproduct recovery.

Frequently, however, the problem is solely one of disposal, without recovery of any useful products. The problem then is to devise the most economical and efficient disposal process. Such a disposal system is that devised by Eastern Division scientists for dairy wastes. Installations of this inexpensive system have been made by several dairies for which the cost of installing conventional systems would have been prohibitive.

### Fundamental Studies

Although fundamental research is rarely so spectacular, and often not so easily comprehended, as applied research, it is the foundation for further progress. The two types of studies go side by side in the utilization research program and often merge into each other. Nevertheless, fundamental chemical and physical studies of agricultural products are vigorously pursued.

The foregoing paragraphs have mentioned some of this basic work. The composition and properties of the protein fraction of milk are under study, for example, including casein, the principal protein, and the whey proteins, some of which are enzymes. The nonprotein nitrogen compounds of milk and the minor components of butterfat are also under investigation. From this work will come improvements in evaporated milk, milk concentrates and powders, and dairy products, and a better understanding of the nutritional value of milk.

The research on the composition of fruits and vegetables and other farm products is another example of basic work that is becoming more important as increasing quantities of food are processed into ready-to-use forms. Composition research is going forward in potatoes and other vegetables and in apples, cherries, honey, and maple sirup.

The allergen studies, which have isolated a hitherto unrecognized protein component of cottonseed and showed conclusively that it is not present in refined cottonseed oil, provide still another example of basic research that has benefited agriculture.

The usefulness of leather products is being extended by the study of the fundamental structure of hides and skins and of the chemical modification of this structure.

Improved keeping quality in meat is the goal of experiments on enzyme activity in freezer-stored meat and on inhibition of microbial growth during the curing of meat.

These and many other researches of a fundamental nature have a large and important place in the utilization research program of the Eastern Division.

## PUBLICATIONS AND PATENTS

The Eastern Division has been responsible for almost a thousand publications since its establishment. Most of these are technical articles in scientific journals, and describe the results of research work done by Division scientists. A list of current publications is issued semianually. Such a list is supplied on request.

When patentable inventions are made, a patent assigned to the Secretary of Agriculture is applied for in the name of the person who made the invention. Cost-free licenses to U. S. individuals and organizations are issued on patented inventions of the Department.

Two hundred and eighteen patents have been obtained since the Laboratory was established. These patents cover a wide range of subject matter; for example, insecticides and fungicides (16); products from starch (12); new chemical compounds and processes (101); vitamins and drugs (24); synthetic and natural rubber and polymers (34); food processing (11); instruments and machines (10); and miscellaneous processes, products, and equipment (10).

**GENERAL INFORMATION ABOUT THE UTILIZATION RESEARCH  
AND DEVELOPMENT DIVISIONS**

Division	Director of Division	Mailing Address	Division Area*	Fields of Research
Eastern	P. A. Wells	600 E. Mermaid Lane Philadelphia 18, Pa.	Conn., Del., Ky., Maine, Md., Mass., N. H., N. J., N. Y., Pa., R. I., Vt., Va., W. Va.	Eastern deciduous fruits; Eastern vegetables; meat; dairy products; animal hides; tanning materials and leather; honey; maple products; tobacco; wool byproducts; plant precursors of cortisone; biologically active plant compounds; and allergens of agricultural products.
Northern	W. D. Maclay	825 No. University St. Peoria 5, Ill.	Ill., Ind., Iowa, Kans., Mich., Minn., Mo., Nebr., N. Dak., Ohio, S. Dak., Wis.	Agricultural residues; corn, wheat, and other cereal crops; soybeans and other oilseed crops.
Southern	C. H. Fisher	2100 Robert E. Lee Blvd. New Orleans 19, La.	Ala., Ark., Fla., Ga., La., Miss., N. C., Okla., S. C., Tenn., Texas	Cotton, cottonseed, tung fruit, peanuts, rice, sugarcane, pine gum, citrus fruits, sweetpotatoes, cucumbers, and other vegetables.
Western	M. J. Copley	800 Buchanan Street Albany 10, Calif.	Ariz., Calif., Colo., Idaho, Mont., Nev., N. Mex., Oreg., Utah, Wash., Wyo., Hawaii, Alaska.	Western fruits and tree nuts; Western vegetables; poultry products; alfalfa and other forage legumes; wheat; rice; wool and mohair; sugar beets; and dry beans and peas.

\*States listed are those primarily served by the particular Division, although the research programs of each Division are of national scope and interest.



